

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 10/786,079

REMARKS

Reconsideration and allowance of the subject application are respectfully requested.

Upon entry of this Amendment, claims 1-10 are pending in the application. Applicant respectfully submits that the pending claims define patentable subject matter.

Claims 1-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Papernyi et al. (U.S. Patent No. 6,480,326; hereafter “Papernyi”) in view of Vakhshoori et al. (U.S. Patent Application Publication No. 2004/0247275; hereafter “Vakhshoori”). Applicant respectfully traverses the prior art rejection.

With regard to independent claims 1 and 4, the Examiner asserts that Papernyi discloses all of the features of the claimed invention except for a semiconductor amplified spontaneous emission (ASE) source for the production of optical pumping seed. However, the Examiner cites Vakhshoori for disclosing “that it was desirable to use a semiconductor ASE source to amplify an optical signal in a fiber link, thus rendering the use of a semiconductor ASE source as element (9) in Papernyi et al obvious to a person of ordinary skill in the art of Raman amplification.¹

Amended independent claim 4 recites:

a low-power semiconductor amplified spontaneous emission source to be optically connected to a link fiber for the production of optical pumping seed at a first wavelength;

a high-power pump source to be optically connected to said link fiber and having the property to emit light to be transmitted to said link fiber at a second

¹ The Examiner relies on Vakhshoori’s incorporation by reference of U.S. application no. 10/632,779 which corresponds to WO 2004/013980 A2 (i.e., the Examiner is relying on the disclosure of WO 2004/013980 in support of the rejection).

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wavelength ensuring a Raman amplification of said optical pumping seed when propagating through said link fiber together with said optical pumping seed, said amplified optical pumping seed being chosen to provide Raman amplification of an optical signal propagating through said link fiber at a third wavelength, wherein energy is transferred from the second wavelength to the first wavelength which is transferred to the third wavelength.

Amended independent claim 1 recites similar features.

The present invention utilizes a high power pump to pump by a Raman effect an ASE broadband emission which has a lower power. The wavelengths are adapted to fit to Raman pumping of the wavelengths of the broadband source which is then used to second order pump the data signal.

As shown in Fig. 3, Papernyi discloses a transmission span employing distributed Raman amplification with pumping means including a high-power (>1 W) primary pump source 6 coupled into a fiber section 12 via a WDM coupler 7, and first and second low-power (typically tens of mW) laser diode seed sources 8 and 9 having outputs which are combined via WDM coupler 10 and coupled into the transmission fiber via WDM coupler 11. Thus, in Papernyi, the second source is not a broadband source but instead is seed sources with small bandwidth. As disclosed in column 8, line 46 of Papernyi, additional seed sources may be used to broaden the spectrum and to adapt the gain. Utilizing a high power pump source Raman pumping a single seed source is less effective in adapting gain of the resulting second order pumping. Further, utilizing several seed sources parallel pumped is complicated to implement and expensive.

The publication by Vakhshoori et al. (discussed on page 3 of the present application) discloses a high power ASE source used as a Raman pump for the data signal. The high level of

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ASE is achieved by a combination of a low power SOA and a long waveguide semiconductor.

The standard SOA source is still a low power source. Similarly, USP Appln. Pub. No. 2004/0247275 to Vakhshoori discloses a ASE source for Raman pumping in a combination of an SOA and a waveguide. WO 2003024162 to Vakhshoori also discloses ASE source for Raman pumping also in a combination of an SOA and a waveguide. Thus, the Vakhshoori references are directed to an ASE source with high power by using an SOA with an additional waveguide amplification for a first order pumping of a data signal.

In the present invention, the objective is to optimize Raman gain for the data signal and the related noise figure. However, the solution of Papernyi uses a two step process with conventional light sources (small bandwidth) where the number of sources are related to the gain of the Raman amplifier. On the other hand, the solution of Vakhshoori is to boost the small level of ASE emission of the SOA to achieve a Raman gain.

The present invention aims to optimize noise and gain by using a conventional low power SOA and to boost this output by using an external light source which is a Raman pump source. An energy exchange is achieved from pump power to SOA emission and the resulting broadband SOA/Raman light is a second Raman source pumping the data signal.

Applicant submits that one of ordinary skill in the art would not have been motivated to modify Papernyi's system based on the teachings of Vakhshoori to produce the claimed invention.² In particular, a person skilled in the art using a light source as disclosed in V

² To establish a *prima facie* case of obviousness under 35 U.S.C. § 103, there must be some suggestion or motivation to modify or combine the reference teachings. "To support the conclusion that the claimed invention is directed to obvious subject matter, either references must expressly or impliedly ... (footnote continued)

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Vakhshoori would look for another possibility to achieve broadband ASE for Raman pumping, i.e., to improvement of SOA amplifiers, trying to optimize waveguide booster structures. On the other hand, a person skilled in the art wanting to improve the gain of Papernyi's system would simply add additional laser diode seed sources.

Accordingly, Applicant respectfully submits that "the use of a semiconductor ASE source as [a seed source] in Papernyi et al" would not have been obvious to a person of ordinary skill in the art of Raman amplification as the Examiner contends.

In view of the above, Applicant respectfully submits that claims 1-10 would not have been rendered obvious in view of the cited references.

Reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the reference." *Ex parte Clapp* 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

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Respectfully submitted,


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CERTIFICATION OF FACSIMILE TRANSMISSION

Sir:

I hereby certify that the above identified correspondence is being facsimile transmitted to Examiner Hellner at the Patent and Trademark Office on October 26, 2005 at 57-273-8300.

Respectfully submitted,


Christopher R. Lipp